

## ABSTRACT OF THE DISCLOSURE

A bioreactor generates load-bearing cartilaginous or fibro-cartilaginous tissue by applying hydrostatic pressure and/or deformational loading to scaffolds seeded with chondrocytes and/or other cells. A scaffold may be shaped to reproduce the geometry of all or part of a load bearing articular surface or defect as acquired from a database or patient-specific geometry data. Optionally a scaffold can be attached to a substrate which promotes integration of this tissue construct with the underlying bone of the patient joint. In the bioreactor, ambient hydrostatic pressure and scaffold deformational loading can be prescribed with any desired waveform, using magnitudes which prevail in diarthrodial joints. The loading platen, permeable or impermeable, may conform to all or part of the scaffold surfaces.